preferably increasingly, towards the air delivery end of teh rotational axis.

The invention is not solely applicable to axial flow fans. It has been found experimentally to be useful in mixed flow fans. These have generally radially extending impeller blades like an axial fan, but the fan is designed so as to produce a flow characteristic including generally axial intake but with delivery from the fan including a centrifugal or any rate radially directed component. This may result from shaping of the hub and/or of the duct in which the blades rotate, or by using a shroud which is effectively equal to the duct section in which the blades rotate but which is rotatable with the blades. Additionally or alternatively the effect may be caused by the shape and/or location of the blades. In particular, the blades may have axes which lie in planes generally radial of the rotational axis, but which axes are inclined in that plane so as to be contained on the surface of an imaginary cone instead of lying in a plane normal to the axis of rotation.

It has been found that with mixed flow fans occurrences happen similar to the effect described above in relation to scimitar sickle bladed axial fans, especially when the mixed flow fan has a spherical hub and spherical shroud designed to accommodate at least adjustable pitch blades, that is to say ones which are rotatable about their individual axis to any of a range of positions to give different fan characteristic.

It has been found beneficial when designing such impellers for installations requiring either radial or axial airflow discharge that the tip shroud be relatively short in the rearward direction so as to allow the main airflow to radially expand off the protruding blade tips when the installation allows. That is to say, the shroud has an axial length which is less than the developed axial length of the tip chord.

This flow benefit, when the mixed flow fan is installed in a roof unit, is also apparent when the impeller is run in a ducted configuration. However, in the latter the same increasing power phenomena at reduced flow as experienced in the axial fans is present. This can be overcome by the use of a flat, tapered or contoured hub defector ring at the rear of the blade root, with little or no effect on the main flow achievement.

The roof of each fan blade may extend substantially to the outer edge of the deflector ring. The fan blade may include an extension adjacent to the hub in the air delivery direction. The extension may be triangular.

A typical application of the invention is now more particularly described with reference to the accompanying drawing wherein the sole figure is a sectional elevation view of a mixed flow fan. In the drawing the fan motor may be provided at the location 10 upstream of the fan, that is to say at the inlet end or alternatively at the location 12 which is at the downstream or the delivery end. The arrangement includes a fixed duct 14 providing the inlet and a portion which is substantially a continuation of the fixed duct but is a rotating shroud 16.

The blades are fixed to a hub structure 18 including a part spherical portion 20 and an outwardly flared hub deflector ring portion 22. The one curve may fair smoothly into the other as shown. The shroud 16 may also be part spherical and the centre of curvature of the part spherical area of the shroud and that of the hub 20 may be common.

A plurality of blades 24 are provided fixed at each end to the hub and shroud respectively. The inner and outer ends are shaped to make a close fit with the shroud and with the hub.

CLAIMS

1. An axil or mixed flow fan comprising fan blades extending from a hub provided with a deflector ring at the air delivery end of the rotational axis, each fan blade including an extension adjacent the hub in the air delivery direction.

2. A fan as claimed in Claim 1, wherein the hub deflector ring in the fan is of a cross section which broadens towards the air delivery end of the rotational axis.

3. A fan as claimed in Claim 2, wherein the hub deflector ring is of a curved cross-section becoming increasingly broad towards the air delivery end of the rotational axis.

4. A fan as claimed in any of claims 1, 2 and 3 wherein the extension is triangular.

5. A fan as claimed in any preceding Claim, wherein the fan is a mixed flow fan and the fan blades have axes which lie in planes generally radial of the rotational axis, but which axes are inclined in that plane so as to be contained on the surface of an imaginary cone instead of lying in a plane normal to the axis of rotation.

6. A fan as claimed in any preceding claim, wherein the fan includes a shroud and the shroud has an axial length which is less than the developed

axial length of the blade tip chord.

7. A fan as claimed in any preceding claim wherein the blades have adjustable pitch.

8. A fan as claimed in Claim 7, wherein the mixed flow fan has a part spherical hub.

9. A fan as claimed in Claim 7 or 8 wherein the fan has a part spherical shroud.

10. A fan as claimed in any preceding claim, wherein the extension extends the root of each fan blade substantially to the outer edge of the deflector ring.

11. A fan as claimed in any preceding claim, wherein the fan is a large tip chord fan.